

T News Letter **TDARS**

G3ZME
G6ZME

TELFORD AND DISTRICT AMATEUR RADIO SOCIETY

www.TDARS.org.uk

FOUNDED 1969

www.TelfordHamfest.co.uk

Issue 274

July/August 2016

www.TDARS.org.uk

Programme

www.telfordhamfest.co.uk

July 13 VHF NFD Debrief (brief), followed by practical tech workshops covering multimeters, the Spectrum analyser, and the proper use of self-amalgamating tape

July 20 Annual Barbeque on LW Village Field. Note: all meals must be paid for beforehand. Latecomers take your chance for available food

July 27 DF hunting explained—how to use the tdars DF antennas/offset osc.

August 3 Competitive DF Hunting with Bob Titterington G3ORY. Guest speaker. Note: this replaces the usual 'first-in-the-month committee meeting'. Meet at LWVH as usual, then proceed to LW Village Field (Behind The Huntsman)

August 10 Committee Meeting and GX3ZME on-the-air

August 17 Telford HamFest preparation. All helpers please attend.

August 24 "GNU Radio" - Talk by Heather M0HMO

August 31 Final preparations for TELFORD HAMFEST. Helpers please attend

SEPTEMBER 4 Telford HamFest Sunday. Set-up Saturday evening from 4:30pm

September 7 First-in-the-month Committee Meeting and GX3ZME on-the-air

September 14 HamFest Debrief followed by Guernsey Trip video, tales, photos

September 21 The 'Rig Expert' antenna analyser. Paul 2E0TIL (M0xxx)

September 24-25 (weekend) Railways on the Air—Horsehay Steam Trust

September 28 TBA

**For Amateur Radio Exam Training—enquiries to Mike G3JKX (01952 299677)
For Morse Training and Morse Proficiency Tests Martyn G3UKV or Eric M0KZB.
For Equipment Loans & Returns contact Don M0TBQ.**

Radio Amateur Exams- Latest: www.tdars.org.uk/html/training.html

VILLAGE HALL, MALTHOUSE BANK, LITTLE WENLOCK, TELFORD, SHROPSHIRE. TF6 5BG

Editorial

This Newsletter is a month or so late, due to all the activities taking place, and even the occasional family commitment or event. So there's lots to report on, with several members contributing photos and text to vary the style and content. I tend to limit the number of pictures here since they take up a lot of space, not to mention expensive laser toner; the TDARS website, including Facebook/Twitter, is a better place for multiple piccies, or even movies.

By the time of the next Newsletter, the 39th (or 11th solely organised by tders at Enginuity) will have taken place. Please make every effort to help both on Saturday (3rd Sept) setting up from 4:30pm (about 2 hours), and on the Sunday (7:30am onwards) until we wind up at about 5pm to go for a well-earned free drink and nibbles across the road at the Coalbrookdale Inn. Last year we struggled a bit at times, particularly early on Sunday morning with every trader arriving at about the same time. During the rally, everyone likes to have a look around, of course, but please remember that we are ORGANISERS, and that the future of the Telford HamFest in years to come is in your hands.

MIV (1)

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Some contest results:-

- . November 160m Club Calls GX3ZME (QTH G3UKV). **22nd** of 122 stns, 30th of 50 club entries.
- . May 10GHz Trophy (Brown Clee) **4th** with 10 QSOs. Ops G8UGL, G4NKC, G3UKV.
- . May 5.7GHz(Brown Clee) G3ZME/P **1st**. May 10GHz (Brown Clee) G3ZME/P **1st**. TDARS uW Gp.
- . May UHF/SHF (Brown Clee) G3ZME/P **6th** of 17 entries.
- . June 50MHz Trophy(Long Mynd) Claimed score 266383pts, 289 QSOs. Currently **7th**. 'UFE Team.
- . July **VHF NFD** Claimed scores only:- **50MHz 7th**, R section –74 QSOs, 12122 points.
144MHz 1st, R section,- 249 QSOs, 51946 pts. **432MHz 2nd** L section, - 68 QSOs, 13864 pts.
1296MHz 2nd, L section, - 47 QSOs, 8569 pts. (note: putting in claimed scores is optional, not the final adjudicated scores and others may have entered but not show up in these tables !)

All the above are very commendable results, and go to show what members have achieved in recent months. However, many active tdxars participants would like to see more members taking part, even if only for a few hours—the spirit of help and support is in the best traditions of Amateur Radio, even if contesting is not your scene. You might even find that contesting is better than you think—and it is the certain way of improving your operating skills, and possibly your own station equipment and effectiveness.

TELFORD & DISTRICT AMATEUR RADIO SOCIETY

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Certs: G3UKV; QSL Man. Paul M0PNN; Assist. Curator: TBA; Village Hall Committee Liaison officer Martin 2E0TRO



Qtc: News & Information



TDARS MEETINGS EVERY WEDNESDAY AT LITTLE WENLOCK VILLAGE HALL UNLESS INDICATED OTHERWISE ON THE FRONT PAGE PROGRAMME. ROOM BOOKED FROM 7PM - 10PM. MEETINGS USUALLY COMMENCE AT 8PM

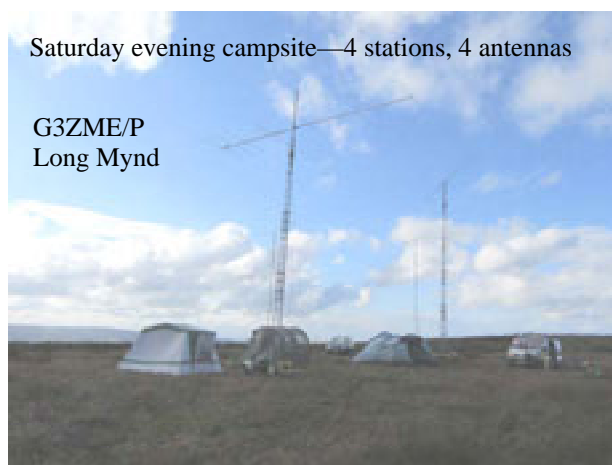
Please note: A current membership card must be shown to borrow TDARS equipment. Please return borrowed equipment promptly .

As you can see from the contest scores at the bottom of the previous pages, things have been quite busy on the /Portable front. As promised, here is a definitive list (says he, hopefully....) of everyone who helped with VHF NFD at the start of July. Paul M0PNN, Heather M0HMO, Paul G6AQA, Brian G6UDX, Robin G1MHU, Martyn G3UKV, Eric M0KZB, Don M0FHM, Simon G0UFE, Speedy 2E0KLS, Mike G3JKX, Mike G4NKC, Kevin G8UPF, John M0JZH, Graham G7LMF, Dave G0CER, Rob M0TOY, Paul 2E0TIL and John G4YDT. Of these, about 9 actually operated one of the four Field Day stations. Many thanks to everyone involved, and if I've missed anyone, please let your editor know.

It was a very breezy set-up on Saturday, and a number of things, apart from the weather, made the event quite challenging. The generator kept hunting as the small spring on the carburettor governor snapped, 6 metres was dead for almost the entire period of operation (just one non British Isles station worked), the 2m rotator failed, and necessitated removing the rotator from the 6m mast, losing the last 3 hours of 6 metre operation. The 2m and 70cm stations were far too close to each other, giving both some mutual QRM, the 23cm pre-amp was blown up (by someone well known to me). But despite all these mishaps, the members present were reasonably happy with the outcome, and the sun came out on Sunday, making the final clear-up fairly straightforward, with dry tents and smiles all round.

Saturday evening campsite—4 stations, 4 antennas

G3ZME/P
Long Mynd



In the last Newsletter was the Report for our AGM. Unfortunately, although it was known by one or two members, we were prohibited from announcing the outcome of the RSGB Club of the Year (CotY) 2015 until after the RSGB's AGM later in April.

Some of the members present for IMD at Tywyn, April 22-24. CotY celebration time.



Simon 'UFE' waving his ISS boom around...

However, as many members were present at the International Marconi Day in Wales at the Tywyn, Marconi site, Eric (M0KZB, Chairman) on behalf of TDARS, was able to receive the West Midlands (Region 5) Trophy for larger clubs CotY from Martyn G3UKV — wearing his Regional Manager's badge. It took place in the middle of the Marconi Day field, close to the Marconi cottages. The last time we entered was in 2011 when we also won



Eric, M0KZB arranged a special 2 metre DF hunt session in the LW Village Field, using 3 robotic TXs on 2 metres, which sent sequentially one, two or three "dits" to identify themselves. All present failed spectacularly to identify which of several flags showed the precise location of each transmitter, but we all learnt a lot about close-in direction finding, and the value of the 'offset oscillator' yagi units built by Derek G0EYX some time ago. Thanks to Eric who made the QRP robots especially and organised this unique and interesting event. There's a video of that evening's event on the Club webpage, under the 'photos' tab.



In case you're wondering, this is Paul 2E0TIL demonstrating his 'Rig Expert' widget whilst at Eaton Manor. It will also be the topic of Paul's presentation to the club later in September (page 1), when he demonstrates the facilities available on the newer generation of antenna analysers, such as this one. (AA-230 Zoom)



Whilst the G0UFE team were busy making contacts in the 50MHz Trophy contest, another group were busy at Blists Hill Museum in Madeley, showing countless visitors some aspects of communications in the 1940s. The event has become annual, and the site is

Busy in the Boys Brigade Hut



re-named "**BLITZ HILL**", with a reference to WWII of course. As you can see, we tried to be suitably dressed, and in our hut we had an old valve receiver that worked excellently on a piece of wire, a suitcase 'Spy set', a crystal set and two sets of morse oscillators for anyone to have a go at sending and de-coding morse—which was as popular as ever. Ops included G0VXG, M0TAW, G8VZT, 2E0TRO, G3UKV

Blitz Hill kit—G0VXG, M0TAW, G8VZT and 2E0TRO



LWVH now has the Internet and Wi-Fi installed, so we should be able to link up easily for Members' usage, talks and visiting speakers. The next step is to link in GB3TF Fusion Digital Voice to the system.

Malcolm 2E1DYL has kindly made a Donations Box, so that non members and visitors can drop in a donation when we have guest speakers at any of our weekly meetings. The amount suggested varies according to costs.



In May, a "**Backpackers Night**" was organised in the LW Village Field.

Quite a few Members brought along a range of equipment and antennas, but Martyn G3UKV was the first (and only?) one to make a QSO using a mobile whip and FT817 with 5 watts O/P. He worked a Norwegian station on SSB on 20 metres.



As noted elsewhere, not everything went smoothly on **VHF NFD**, but a good time was had by all, and now we have confirmation that the site we use is NOT owned by the National Trust, we were all a bit more relaxed than usual. Just a few weeks prior to Field Day, one of the trailer masts had a tyre split, causing an emergency stop on the way home (from Long Mynd 6m contest) via Much Wenlock, and fitting of the spare wheel. One of the side effects was damage to the mud guard on the same axle. This was neatly repaired with a new mud guard before NFD—a tribute to Simon G0UFE's involvement in all things TDARS. Perhaps this is a good time to mention that without Simon's commitment (and work's van!), it is unlikely that we would have entered NFD. He collected and returned equipment from several locations after first emptying his van of work related kit, transported another member of the club (Speedy) to Long Mynd, towed the repaired mobile mast to/from the site, operated for long stretches on 2m, encouraged others to join in, remained cheerful throughout, and the only down side was his frequent and awful puns and jokes. Many thanks Simon.

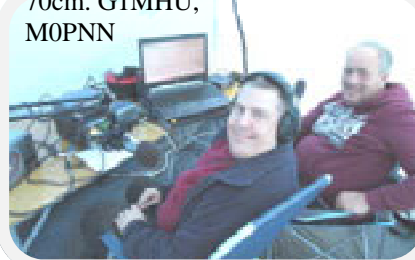
23cm
G8UPF
G4NKC



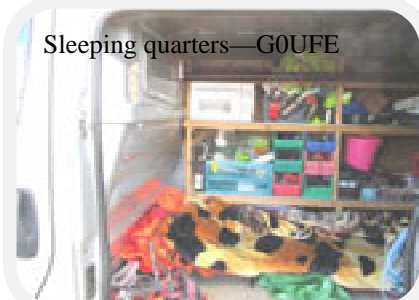
6m—Heather M0HMO,
Paul G6AQA



70cm. G1MHU,
M0PNN



Sleeping quarters—G0UFE



Breakfast arrives—thanks Paul 2E0TIL



VHF NFD—A learning experience...



Whilst on the topic of videos, **John G7ACD appears** in one of the videos recorded whilst Tim Peake was up in the International Space Station—here's the link provided by Robin G1MHU. John appears in a school setting, very near to the final credits <http://www.txfactor.co.uk/txfactor.shtml>. John was the antenna manager during the 10 school links with the ARISS mission, which has now finished. There is talk of a return to space by Tim Peake, but that's well into the future.

Dave G0CER has been working tirelessly to encourage Members to 'have-a-go' on the Tuesday evening **UKAC activities**. Here's a few statistics and more to encourage others to join in.



telfordhams

"We're half way through the year and TDARS group representation entries have seen additional operators entering UKAC - every little or large counts so please put your scores in or any qsos help other clubs. At the time of writing (8/7) I'll concentrate on a short report about the **6m evenings**, the third Tuesday evening of the month, with some comments about 6m operations. We are amazingly ahead of the Cambridge Hams - although, they have been mainly out of action fixing up their van 'Flossie2' after Flossie 1 had to retire...

32	Bredhurst R&TS	471	776	640	754	815	444	3,900
33	Mahern Hills RAC	510	701	760	509	648	667	3,795
34	Telford & DARS	630	607	682	615	604	635	3,773
35	Mid Somerset ARC	813	765	733	615	688	0	3,614
36	Camb-Hams	512	663	364	393	702	206	2,920

The club above us consists of one active person - so if we can get one or two more putting in entries, we may be able to move on up one or two places in this month's placings.

Individual Placings:- (50 MHz only. All other bands upto 10GHz have been entered this year by members—Ed)

50MHz UKAC 2016

Club Scores Telford & DARS

Click on date links for detailed results and UBNs

Pos	Call	26/01/16	23/02/16	22/03/16	26/04/16	24/05/16	28/06/16	Total
Pos by Month		34	32	32	32	34	34	
1	G0CER	630	607	620	615	587	635	3,694
2	G8UGL			62				62
3	G7LMF					17		17
TOTALS		630	607	682	615	604	635	3773



@g3zme

Squares	26/01/16	23/02/16	22/03/16	26/04/16	24/05/16	28/06/16
IO89			1	1	1	
IO84	2	3	2	2	4	4
IO76	1		1		2	1
IO72		2				
IO73		1	1	2	1	1
IO74	3	3	6	3	3	2
IO75	2	2	1	3	3	3
IO77	1		1	2	1	
IO78	2	2	2	2	2	2
IO80	4	7	5	6	6	10
IO81	17	22	20	23	36	24
IO82	11	10	18	10	20	18
IO83	41	47	35	34	58	39
IO84	1	2	2	1	5	2
IO85	3	5	4	3	1	1
IO86		3	6	2	7	3
IO87	1	1	1	2	1	1
IO88	1		1	1	1	1
IO89			1			
IO90	10	12	10	9	8	12
IO91	43	46	58	60	61	58
IO92	30	27	25	31	34	27
IO93	65	64	78	64	60	57
IO94	1	4	6	3	5	7
JO90		3	3	3	2	1
JO91	16	21	17	16	22	15
JO92	14	14	12	11	12	11
JO93	2	2	2	2	2	2
UK Sigs	22	23	26	24	26	27
Other Sigs	5	3	5	5	11	102
Active Sigs	276	311	323	309	384	509
Entries	186	201	219	188	182	192

Look at the activity across the country - our IO82 square is now one of the more active square - but very often in all UKAC weeks we get 'thanks for the new square' in the reply, so IO82 is still a sought after square.

This year IO93 has lit up in activity, with totals of individuals joining UKAC evenings averaging 65 operators, with IO83 at 42 yet our square has 17 on avg. IO93 covers most of the Peak District, so stations are strong into Shropshire.

Of course this time of the year is the most exciting time on the Magic band - the maximum usable frequency goes up often above 100MHz with Summer Sporadic E layer is ionised and enhanced propagation can suddenly happen, early evening and into a UKAC evening with plenty of miles to boost your entry, it's always good to get as many entries in your log, everyone else will be too. (Call, Serial and Locator logged). Also - digimode qsos are allowed now, something to explore, but I have not yet...

6m has HF-like tendencies (when its open you feel like you're on 28Mhz!). It is affected by propagation modes that are distinctly VHF - typically 'Sporadic E' layer enhancement and rather nicely TEP Trans-Equatorial-Propagation which can allow QSOs to Japan (in mornings), America or Southern Africa. (but rare this down side of cycle 24—Ed)

Our very own Simon 'UFE' has a nice card from Australia confirming a QSO. It's good to keep an eye on DX clusters for a warning, and use of ON4KST chat-cluster is allowed in UKAC (and dx-clusters are allowed in increasing numbers of contests these days).

Antenna

Optimally a beam - push all your RF in one direction and focus on the station you want, minimising others (even null out a strong nearby station so you can hear the distant one. There are dual 6 and 4m versions.

Because not everyone can have a beam, a wire dipole is the simplest you can use - you really need it away from nearby metal objects and reasonably high, so they are not so easily seen, which can be an advantage. People have made cane supported dipoles and immovable beams this way, Go try it, experiment!

Many vertical HF antennas will happily tune to 50mhz or HF wire antennas - an ATU is a must. When 6m is buzzing with stations, as it has been a few times this last couple of months, I tested out calling an EA3 station on my Cushcraft multi-band HF vert and worked him. Always worth a try if you can hear them. [don't forget to match the antenna to the radio] I have used a 'halo' on 6m which gave me all-UK abilities on a flat evening with my FT817 in North Yorks.

Do give 6m a try, it's called the magic band - as flat conditions are mainly inter-UK QSOs, small lifts will get you EU qsos and in TEP conditions; I worked in the US and Canada with 80w into a beam that I bought off Derek in the last club sale.

Please join us on UKAC evening and give it a try, there are people who are now getting over 260 qsos - it certainly helps you learn about what works and what doesn't.

Useful websites:

<http://www.ham-radio.com/n6ca/50MHz/6mtrdx.html>

<http://www.on4kst.org/chat/login.php?band=1>

http://hfradio.org.uk/html/50mhz_up.html

<https://gx8srs.wordpress.com/an-introduction-to-operating-on-six-metres-50mhz/>

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Mike's Piece: July 2016

A Balun, short for **B**alance to **U**nbalance transformer, is very necessary when feeding a dipole, whether on its own or as the driven element of a Yagi. Without a balun, and connecting coaxial cable directly to a dipole, will cause the published aerial radiation pattern to be badly distorted. This is because the outer screening of the cable, which is in effect a long wire aerial, is now connected to one half of the dipole. So the balance is completely ruined. Secondly, precious RF will now travel back down the outer screening, radiating as it goes and end up back in the shack, where it can get into your microphone and other electronics. Not a good idea.

Another important fact to know about a balun is that, if you have a turns ratio of 3 : 1, the impedance transformation is the SQUARE of this, i.e 9 : 1. Perfect if you want match 450 ohms ladder line to your 50 ohm coaxial cable. If you wanted to match a long wire aerial to 50 ohms then a 9 : 1 balun will have an impedance ratio of 81 : 1 which matches 4050 ohms to 50 ohms.

By using tapping points on the primary and/or secondary windings of a balun, you can match almost any impedance to coaxial cable. They are very easy to make and there are loads of books on this subject out there. And you do not have to spend a fortune buying a ready made one. Make sure though that you make it large enough to withstand the maximum power that you are going to put through it. If not, it may saturate and the transformation then goes all to pot and it basically won't work. Sometimes this means having two large ferrite rings taped together.

Why use ferrite rings? Well you probably want to run your aerial on different bands so the ferrite rings broadband the balun. You could have an air wound balun if your aerial is just for one band.

Whatever you do, make very sure that any soldered or mechanical joints are completely waterproof. I use liquid rubber from a bottle. It is not cheap but it is the best. Self-amalgamating tape is good too. Buy these on line for the cheapest.



P.S. Hi all

Mike, G3JKX, is running a Foundation Course QTHR on Saturdays 9th/16th July between 0900 & 1630hrs, with the Exam session on Wednesday 20th at 1800hrs. The course will run with just one student. Intending candidates should telephone me on 01952 299677 to book a place as soon as possible. [E-mail dated 2 June—Ed]

73 Mike G3JKX

Thanks for Newsletter input this time:

Paul M0PNN, Mike G3JKX, Brian G6UDX, Graham G7LMF, Robin G1MHU,

Dave G0CER, Don M0FHM, Phil G4JCP;

Next edition mid September: Keep it coming-don't be shy!

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Editorial Postscript:

'How to modify AT and ATX Computer Power Supplies' - by Brian G6UDX

Due to some formatting issues, part of Brian's article last Newsletter (April/May) got omitted, for which apologies.

In particular the section explaining the why's and wherefore's of combining 2 or more PSUs was missing, so here it is:-

"Should you want a 24v or 36v supply, despite what some authorities say, it is possible to successfully connect a number of SMPSSs in series provided a few simple rules are followed. Firstly I strongly recommend that all units are the same model. Or failing that, at least the same, wattage output.

Firstly modify each of the PSUs following the instructions for a singleton.

Disconnect the earth from all but the one unit that is at the "cold" end of the chain and mount all units inside a stout housing ensuring the chassis of all but the cold end PSU is isolated from any metalwork of the housing.

Connect each of the 230v inputs in parallel and the +12v outputs in series.

Connect an inverse diode across each of the +12v outputs. This diode should be rated at the total rated voltage of the PSU you are constructing e.g. 24v or 36v and capable of carrying the maximum current output of the PSU you are building."

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GB100TVC – Tern Valley Cubs 100 Adventure Camp—by Graham G7LMF

To celebrate 100 years of Cub Scouting Adventure, the Tern Valley Cubs Adventure Camp took place on the weekend of Saturday 25th—Sunday 26th June 2016. Simon G0UFE, John M0JZH and Graham G7LMF set up a special event station at in The Grand Valley at Hawkstone Park Follies near Weston-on-Redcastle (SJ572297)

We arrived on site at 07:30 on Saturday morning to be greeted by a sea of tents and more

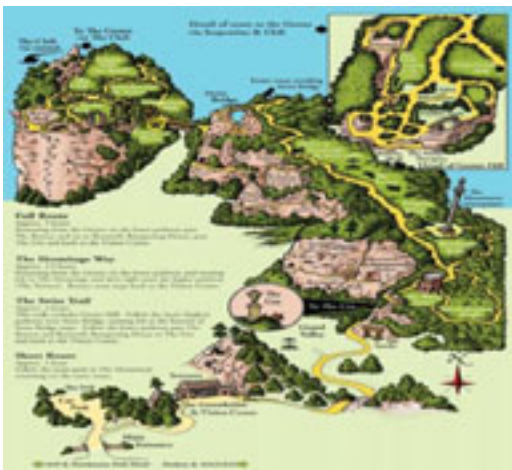
by a sea of tents and more than 600 excited cubs running around (Camping is the favourite activity 8 – 10 ½ year old Cubs).

Once we had negotiated the van and trailer safely into position we set up the TDARS tent amongst the hundreds of other tents and installed the Comet H422 Antenna in the V configuration on the mast. We then connected the equipment for the weekend consisting of an Icom IC-7600 (running 100 watts) with desk-mike and extension speaker.



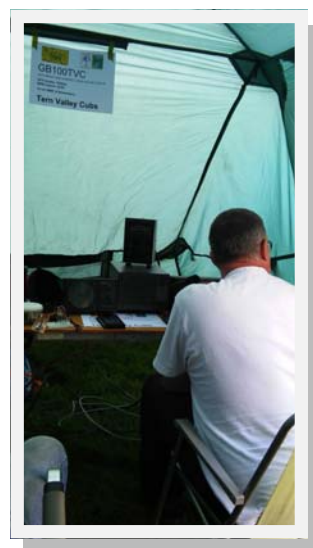
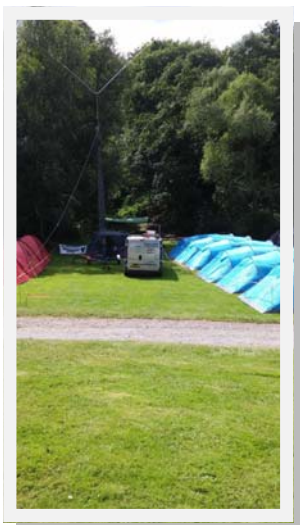
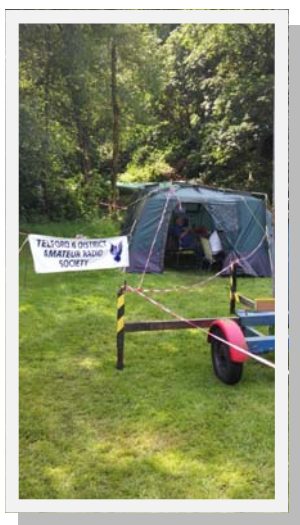
Simon had also brought
g 5watts through a 40/80m
this radio shown through a

Being in a valley, coupled with the poor conditions on the bands at present, we did have some concerns that we weren't going to get any activity but throughout the weekend we managed 88



QSO's across 10 countries including our furthest contact in Germany.
We did manage to talk to loads of stations running for MOTA (Museums on the air) and also **GB100LC** (Luton Cubs celebrating the centenary as well).

Because the cubs had a really packed programme of events there were very few through the flap of the tent. One group came in when the bands were particularly flat, but John showed them some of his gadgets / projects which kept them interested, another group came in and we got them chatting to an unsuspecting ham from Lincolnshire. The cubs asked him questions like “Do you have a pet?”, “What is your pet’s name?” and “Have you ever been a cub?” The highlight of the weekend has probably got to be when we made contact with the other club members running **GP3ZME/P** over in Guernsey and gave Paul M0PNN the chance to have a chat with his son who was at the cub camp. The little chap’s face was beaming when he was talking to his dad on the radio !



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Guernsey Trip June 2016— by Paul M0PNN

It was a cold wet day in early 2016 when Martyn posted on the club reflector that he was organizing a trip to Guernsey. The first thing I did was phone my brother David MW0UAA : “YES” was his emphatic answer. The ferry was booked and was somewhat more expensive this year because David had bought a transit van and we were taking that.

What bands to take? The plan was to use a 160m to 10m doublet 50m long fed with 450 ohm twin feeder, a 1:1 current balun then a short coax cable to rig. The Doublet to be mounted at right angles to a Comet V dipole 40m/20m/15m/10m on fibreglass pole 4 metres above the V dipole centre. There would be no interaction as only one signal would be used on HF at any one time. That's HF sorted; Now VHF- there was a 50 MHz CW contest on the Sunday and as it's June there should be some good ES around so 50 MHz was going. I refurbished my old 50 MHz Comet 4 element HB9V by replacing all the elements. Two metres is a favourite band of mine so a nine element Tonna was going too. Rigs: a Yaesu FT950 for HF and 50 MHz, a Yaesu FT857D as a spare and the Club's Icom IC910 for 2 metres.

The day soon came and we were off to Guernsey. For me this required a trip via Brecon first. Dave G8VZT had dropped off a 70 MHz antenna mast etc for me to take; my poor car was very weighted down on the trip to Brecon. Having a van made a dramatic difference—you can get a serious amount of stuff in a transit van and we did. The whole time we were in Guernsey we did not spend a penny on food or even have to walk to the farm and fill a water container as it all came with us including two generators 1kw and 2kw in the van

The trip there went well we started off from Brecon at 10pm on Thursday night and arrived in McDonald's in Poole before 2am and parked up for a sleep. We were stopped at customs on the way; thankfully no rubber gloves came out this time. When making a crossing in a van you have to give the address you're staying. This is to stop campervans etc just going and parking up in a lay-by etc.

The crossing was very good—no problems- food stayed in stomach and we found the camp site quite easily this time thanks to Google maps. The weather was good and it's always good to get the tents and the antennas up and down in the dry. I will mention the data monster at the next AGM.

David MW0UAA was not very well for the first couple of days, he had a sore throat which was not very good, but he got round it by using PSK31 on HF. There was good inter-G on forty metres which was very surprising considering how low the solar flux was. We worked many club members Don M0TBQ Paul 2E0TIL John M0JZH and the best moment for me was speaking to Matthew my son at the Scout Camp at Hawkstone Park where other TDARS members were putting on **GB100TVC** Tern Valley Cubs; John, Simon, Graham ***thank you*** for arranging this. We made the best of poor band conditions and gave many UK and European Amateur operators a new one. Short Skip on 20m and 10m was fun giving many UK and Eu op's a new one on those bands. Robin G1MHU spotted us on 40 metres and the pile up lasted for 5 hours and we worked 500 UK and EU stations—thanks Robin.

The screenshot displays two Microsoft Excel workbooks side-by-side.

Left Workbook:

- Title Bar:** MICROSOFT EXCEL - [Book1] - File Home Insert Layout References Formulas Data View Developer
- Status Bar:** 1/20/2016 12:00 PM
- Formulas Tab:** Active
- Worksheet Name:** Sheet1
- Columns:** A: Country, B: Population, C: GDP
- Data:** List of countries including Afghanistan, Albania, Algeria, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, Germany, Greece, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova, Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Rwanda, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Taiwan, Tajikistan, Tanzania, Thailand, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Venezuela, Vietnam, Wales, Yemen, Zambia, Zimbabwe.

Right Workbook:

- Title Bar:** MICROSOFT EXCEL - [Book2] - File Home Insert Layout References Formulas Data View Developer
- Status Bar:** 1/20/2016 12:00 PM
- Formulas Tab:** Active
- Worksheet Name:** Sheet1
- Columns:** A: Country, B: Surface Area, C: Life Expectancy
- Data:** Same list of countries as the left workbook, with corresponding surface area and life expectancy values.

Great fun on the 2m band—many UK stations saying they had not heard GU for a long time. The best DX worked was GM4JJJ in IO86gb at 740km and

Clublog is great resource being able to upload the log before we left the island and knowing it's safe.

Local Net: 144.600 MHz FM—Sunday evenings from 21:00ish

Strange goings on here . . .

Down in the G.A.R.S. bunker 'HQ'...



.~+~+~+~+~+~+~+~+~+~+~+~+~+

Some further VHF NFD Comments taken from the TDARS Yahoo Reflector:-

Eric M0KZB: “Well done to all who supported or attended the VHF national field day event on the Long Mynd over the weekend. A tad windy on Saturday but OK on Sunday, propagation wasn't brilliant but that would be the same for everybody else.

Good turn out, thank you Paul "TIL for the welcome Sausage and Bacon sandwiches (good luck for Wednesday). Someone else supplied apples (sorry, not sure who). Nice to see everyone, loads of leg pulling (no change there then), along with serious contesting."

Mike G3JKX: “Fully agree with Eric. There was a great atmosphere on the VHF Field Day. Full of the usual problems with things going wrong, but the weather was good and because we had a quite big team at the end, we all will have got home round 5pm, as Speedy and I did. Really enjoyed it as usual, especially the usual friendly banter and Paul’s sausages, both very welcome and made for a great day out. Roll on next time. “

And from Robin G1MHU a comment plus some suggestions for the future:

“Well done all that attended.. and thanks for all those that supported the event but were unable to attend for whatever reason. I spoke to a few people about a lot of things... some mental floss.....

SDRplay. SDR Uno software - <http://www.sdrplay.com/windows.html> and I can run a remote team viewer session to get you running if needed .. probably recommended.

Rotator software http://www.qsl.net/yo3dmu/index_Page346.htm best rotator control software!

Rotator control boards. ERC - <http://schmidt-alba.de/eshop/> for the 1000 yaesu, ERC mini.

Pre-amps http://www.wimo.com/mast-preamplifier_e.html <http://www.shf-elektronik.de/> just as good as SSB electronics ones.. if not better.. same designer.. later devices.

Internet access – needs a site wide solution... mifi and a beam.. and a need to vet devices to ensure they have updates turned off etc OK for KST and facebook blogging to promote the event. I used to provide about 1GB of data over the 2 days from Voda then giffgaf.

70cm mast. - needs pegs to stop the rotation of the sections. Inter station comms! In this day and age.. and cost of cheap handies.. set up an intercom frequency.. each station has a frequency.. or all on the same with CTCSS DCS etc and use memories! So 2m can call 23cm and arrange a sched.. Long automated CQ calls should include QRV 23,70 etc. “



Photo taken in April:

Paul 'PNN's comment

“Hmmm...”

Finally, an 8+ pages long article about Digital Voice Communications by kind permission of Phil G4JCP of Dudley takes up the rest of this Newsletter (digital version only)—thanks to a request by Don M0FHM to allow us to use his article, originally printed in the RAOTA Magazine ‘OTnews’.

>>>>>>>>>>>>

Digital Voice Communication

By Philip Cadman G4JCP

Whether you like it or not, digital voice communication is becoming popular in Amateur Radio. It's here and it's here to stay, but whether it will displace analogue voice communication is another matter. There are three major digital voice modes currently in use by radio amateurs: D-Star, System Fusion and DMR.

D-Star is short for Digital Smart Technologies for Amateur Radio, a system developed by the Japan Amateur Radio League (JARL) and marketed primarily by Icom. D-Star was designed solely for amateur use but uses techniques developed by the private mobile radio industry.

It is the least technically advanced of the three systems but it has the advantage of simplicity and 'hackability'. That is, the system - although not the radios themselves - can be modified and enhanced relatively easily and this has been done and is continuing.

System Fusion is Yaesu's answer to D-Star. And like D-Star it has been designed exclusively for amateur use whilst borrowing techniques from the commercial sector. The term 'fusion' alludes to the system's ability to handle both digital voice and analogue f.m. transmissions in a somewhat seamless manner. The system has only recently been introduced and so there are far fewer amateurs using Fusion than D-Star. I'll just use the word 'Fusion' for Yaesu's system from now on.

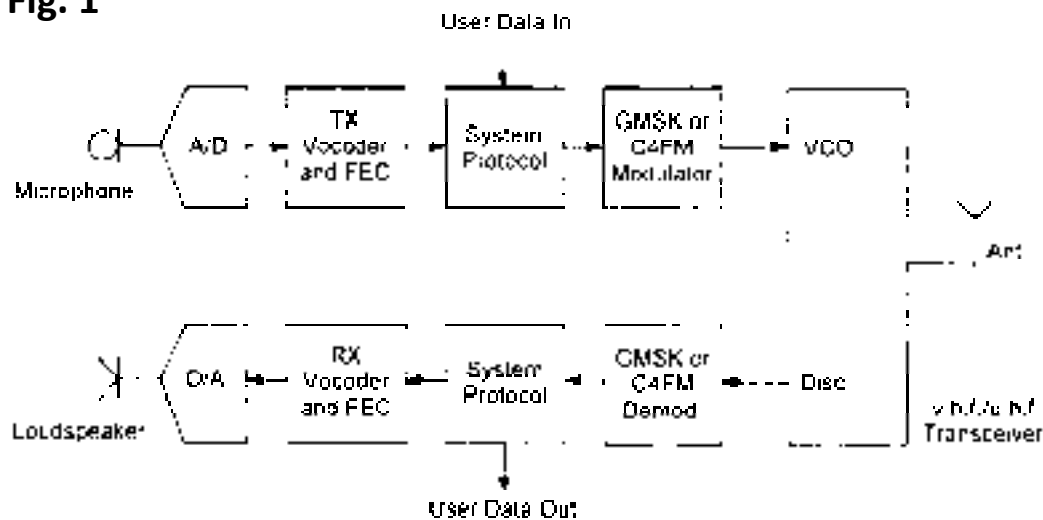
DMR is short for Digital Mobile Radio and is a rather generic term.

However, in amateur use, DMR is usually understood to mean a time division multiplex system manufactured by Motorola (known as Mototrbo).

Hytera, Connect Systems and a few other companies also market DMR radios and systems. Unlike D-Star and Fusion, it is a purely commercial system which has been 'tweaked' to serve the amateur community.

All three systems are conceptually the same although DMR differs from D-Star and Fusion in one fundamental way. As D-Star is the simplest and most widely used system, I'll base this article primarily on that system. By the way, I'm not going to cover the interlinking of repeaters via the Internet. Although all the systems rely heavily on the 'Net for linking, the subject is too involved and fluid to be included here. Digital voice is still a minority interest at the moment, so if you are interested in taking up the mode, find out which system(s) amateurs in your area are using and what repeaters are within your range. All three systems are sufficiently complex that having local amateurs with sufficient experience to guide you is highly desirable.

Fig. 1



Digital Voice Transceivers

Figure 1. shows those stages present in a typical digital voice transceiver which are not present in an analogue transceiver. I believe all current amateur digital voice transceivers can also operate in analogue modes as well. The operator's voice is picked up by the set's microphone and the signal is amplified in the usual way. It's then fed to an analogue to digital (A/D) converter. The output from the A/D converter is a stream of binary numbers usually running at 8,000 samples per second.

The converter will most often produce either 16-bit linear samples or 8-bit companded samples, depending on what the transmit vocoder requires. Vocoder is short for Voice Coder, and it's this component which makes digital voice over narrow radio channels possible.

As I've said, the A/D converter produces - as a minimum - 8,000 8-bit samples every second. That's 64,000 bits per second (bps). Simply modulating a carrier with this bit stream would result in a transmission that occupied a ridiculously wide bandwidth. The number of bits per second has to be reduced somehow. Audio compression techniques used for downloaded music files and for broadcasting are not suitable. They simply don't reduce the number of bits sufficiently, so the vocoder takes a different approach.

The audio bit stream is 'chopped up' into 20mS chunks. Each chunk is analysed using Fourier techniques and certain parameters—such as the fundamental frequency and number and amplitude of harmonics - are extracted. Other characteristics are also noted. Don't ask me to go deeper, this is a hellishly complicated subject, one which I

don't understand myself. You can liken the output of the vocoder to a music score, it isn't quite that, but it's going that way.

The vocoder used by D-Star is made by Digital Voice Systems Inc. (DVS) and is called AMBE - short for Advanced Multi-Band Excitation—and it's widely used in commercial systems. Although DVS will sell you a chip called a vocoder, the vocoder is really just an algorithm implemented in software. Some amateur (and commercial) digital voice transceivers use just such a chip - the AMBE-2020, for example - while other sets use software licensed from DVS running on a general-purpose digital signal processing (DSP) chip fitted in the radio.

In the case of D-Star, the encoded voice output from the vocoder is just 2,400bps. That's a big reduction from 64,000bps. However, unlike human speech, which has natural redundancy, there is no redundancy in the vocoder's output bit stream. Errors are to be strenuously avoided, so the AMBE vocoder can apply forward error correction (FEC). The D-Star voice data includes 1,200bps of FEC coding, giving a total voice bit rate of 3,600bps. So even if quite a few bits are received in error, the correct voice data can be recovered. We can't just send the voice bit stream over the air as-is, extra bits are needed to format the data and to provide identification and routing information. There is also user data to include as well. In the case of D-Star, an additional 1,200bps are allocated for this purpose, making the total transmitted bit rate equal to 4,800bps.

The next step is to frequency modulate the r.f. carrier with the data stream. This is done by shifting the carrier from its nominal frequency in sympathy with the data. It's good-old frequency shift keying (f.s.k.). However, D-Star uses a particular form of f.s.k. known as Minimum Shift Keying (MSK). All that means is the frequency shift is half the transmitted symbol rate. D-Star uses two-level f.s.k. so the symbol rate is the same as the bit rate, that is, 4,800 symbols per second. So the frequency shift is just 2,400Hz. Or put another way, plus and minus 1,200Hz from the nominal carrier frequency.

We're not quite finished yet. Even though the symbol rate is certainly low enough, modulating the carrier with a rectangular waveform will still produce an unacceptably wide transmission. The solution is to shape the data waveform by sending it through a low-pass filter prior to applying it to the voltage controlled oscillator (v.c.o.) in the transmitter. A Gaussian filter characteristic is chosen as that produces a sufficiently narrow transmitted bandwidth. Indeed, a D-Star transmission is approximately half that of a conventional 12.5kHz f.m. transmission.

So that's what the GMSK in D-Star means: Gaussian Minimum Shift Keying. The receive path through a digital voice transceiver is basically the reverse of the transmit path. The output from the radio's f.m. discriminator

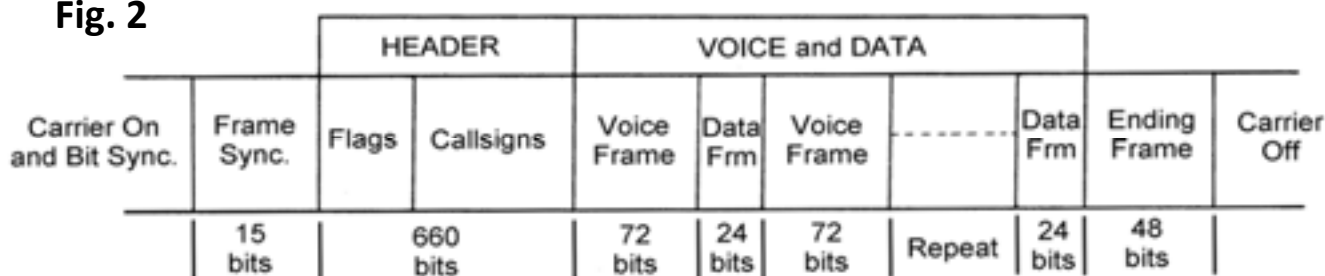
is first low-pass filtered to remove high-frequency noise and then fed to a clock and data recovery circuit. Note that the output from the discriminator must not be high-pass filtered as the GMSK signal has low frequency components which extend almost to d.c. The recovered bit stream is then analysed and split up into its component parts, that is, the formatting and identification data, the digital voice (and FEC) data and the user data.

The voice data is sent to the receive vocoder which then reconstitutes the analogue voice signal as a sequence of numbers. A digital to analogue (D/A) converter followed by some filtering and audio power amplification completes the chain. Although I've shown the transmit and receive vocoders as separate entities, they are almost always combined in the same physical device. For instance, the AMBE-2020 chip can both encode and decode voice data but not at the same time.

A Bit Like Packet Radio

So what actually goes over the air? Well, it's a little reminiscent of Packet Radio, as Figure 2. shows. At the start of an 'over', the transmitter turns on and sends a repetitive bit pattern. This pattern lasts for as long as it takes for the transmitter's output to reach full power plus sufficient time for the distant receiver to detect the signal and lock onto the received bit stream. Then comes a specific 15-bit pattern - the frame sync. - which tells the receiver that the next 660 bits are the transmission's header. The header contains some system data (the flags) plus source and destination callsigns. The callsigns of any repeaters that are to be used to route the transmission are also included here. The entire header is protected by

Fig. 2



Following the header is the digital voice data and user data. Each 20mS chunk of voice audio is sent as a frame of 72 bits which is followed by a 24-bit frame of user data. This pattern repeats for as long as the transmission lasts. The end of the transmission is marked by a special 48-bit ending frame and then the transmitter cuts carrier. There are a couple of points to note about the data frames. Firstly, they include some data used by Icom transceivers which is not in the official JARL D-Star specification. And secondly, the first data frame and every subsequent 21st frame contain a special bit pattern that is used for synchronisation.

If a transmission is temporarily lost then these synchronisation frames allow the receiver to lock back onto the voice and user data frames.

With apologies in advance to any D-Star adherents, I must mention one significant shortcoming of the D-Star protocol. I do so because it's important when comparing digital voice systems. When a transmission is directed at a repeater, the repeater examines the transmission's header to see if it should route the transmission to somewhere else. This applies whether the repeater is only going to rebroadcast the transmission locally, or route it to a distant repeater via the Internet. If the header is corrupted to a degree where the FEC cannot cope, or if the header is lost altogether (which can happen if stations 'double'), then the transmission is ignored by the repeater. An entire over can be lost this way. In addition, the 15-bit frame sync. pattern is totally unprotected. So if that has even a single error it will be lost and the following header will be ignored. Please note that this shortcoming is of no real significance with ordinary simplex QSOs.

Voice Fidelity

Let's be honest, digital voice at 2,400bps does not sound wonderful. And the AMBE vocoder suits some peoples' voices better than others. However, as for intelligibility, in some circumstances digital voice can beat analogue f.m. Because the AMBE and similar vocoders isolate the characteristics of human speech, you get transmit noise reduction for free. In noisy environments - like in a vehicle - this noise reduction can help make the received signal easier to listen to. Furthermore, the received audio exhibits no discriminator noise like you get when receiving a weak analogue f.m. signal. At the limit the received audio either breaks up into an unintelligible racket or the set goes silent. In short, with strong signals analogue f.m. will give the best fidelity. And at the very limit, analogue f.m. may be copyable whereas digital voice will fail. But where the signal is just so-so, digital voice can be more intelligible, and due to the lack of both transmitted and discriminator noise, it can be easier to listen to for long periods.

System Fusion

System Fusion is relatively new and so I have little personal experience of it. However, looking at the specification and seeing what other amateurs have said about the mode, it appears to be an improvement over D-Star. Figure 1. applies equally to Fusion as to D-Star, the only significant difference is the modulation method. Whereas D-Star uses two-level f.s.k. (GMSK), Fusion uses a version of four-level f.s.k. called C4FM. That's short for Continuous 4-Level Frequency Modulation.

To mention some numbers, transmitting '00' causes the carrier to shift +900Hz, '01' shifts the carrier +2,700Hz. And '10' and '11' cause the carrier to shift -900Hz and -2,700Hz respectively. The total transmitted bit rate is 9,600bps, but the symbol rate is the same as D-Star: 4,800 symbols per second. However, because the maximum frequency shift (5,400Hz) is around double that of D-Star, the transmitted bandwidth just about doubles too. Even so, the bandwidth is comparable to a 12.5kHz analogue f.m. transmission.

Fusion uses a slightly improved version of the AMBE vocoder which should give a marginal improvement in fidelity. Actually, this newer AMBE vocoder generates a pure voice bit rate of 2,450bps mixed with 1,150bps of FEC, giving the same combined bit rate of 3,600bps. Another difference is the amount of user and system data that can accompany the voice data, that goes up from 1,200bps to 6,000bps. Unfortunately, around half of that 6,000bps is used by the system overhead. Actually, Fusion has two voice modes that use the 3,600bps voice data rate. It also has a data-only mode where no voice data is sent, and a further 'high-quality' voice-only mode. In this last mode the AMBE vocoder produces pure voice data at 4,400bps with 2,800bps of FEC, making a combined voice data rate of 7,200bps. This voice mode apparently provides noticeably better audio fidelity than either D-Star or DMR.

The formatting of the voice and data frames sent over the air is a lot more complicated than D-Star, so I won't cover it in any detail. But like D-Star, a Fusion transmission begins with a header, then there are repeating voice and data frames, and finally a terminator. The repeating voice and data frames are grouped into blocks of five, each block taking exactly 100mS to transmit. Each block begins with a synchronising pattern and some system information. In addition, source, destination and routing callsigns are included in some of the block's data frames. So even if the transmission's header is lost, the receiver will - after a short time - be able to lock onto the transmission and route it to its destination. There's one exception, this isn't the case when the high-quality voice-only mode is used.

DMR

Both D-Star and Fusion - and all amateur analogue communications - are classed as Frequency Division Multiple Access (FDMA) systems. Basically, if you want to talk, find a clear frequency and get on with it. In other words, it's one conversation on one frequency at a time. With DMR, you can have more than one conversation on one frequency and that's called Time Division Multiple Access or TDMA. Again, Figure 1. shows the digital voice parts of a DMR transceiver.

The modulation is very similar to that of Fusion and is known simply as 4-Level f.s.k., usually shortened to 4FSK. The only real difference is the

deviation, which is plus and minus 648Hz and plus and minus 1,944Hz. So the deviation is a little less than that of Fusion but the symbol rate matches Fusion exactly: 4,800 symbols per second. DMR also uses the same AMBE vocoder that Fusion uses.

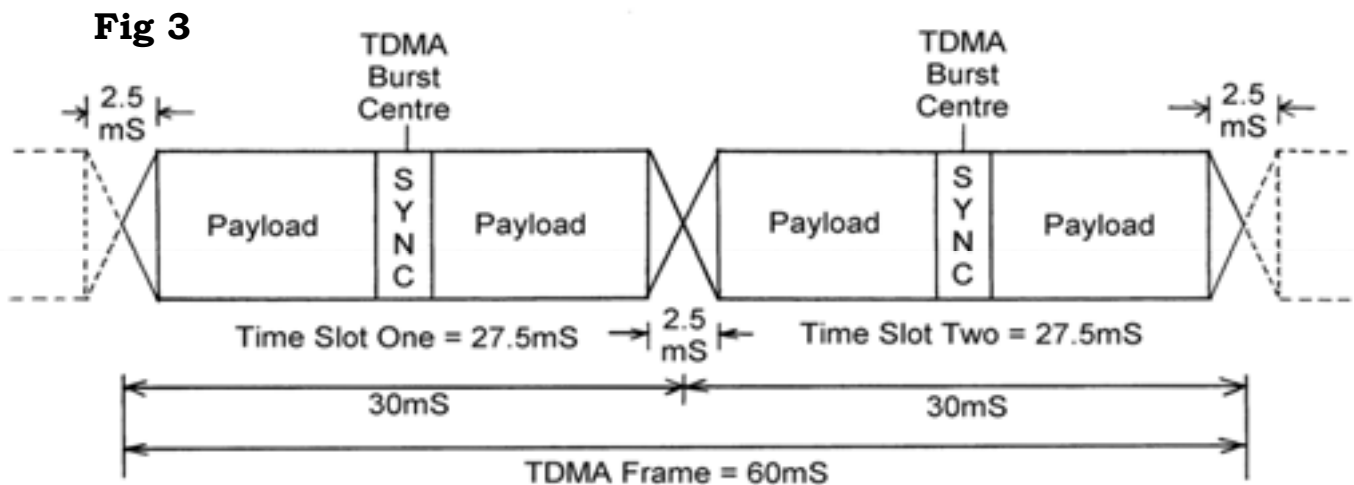


Figure 3. shows diagrammatically one 60mS TDMA frame as viewed from the vantage point of a mobile or portable transmitter. These frames are repeated continuously while a transmission takes place. The 60mS frame is divided into two halves called Time Slot One and Time Slot Two. Each time slot is 30mS long but the active part - that's the part which carries data and synchronisation bits - is 27.5mS long. The 2.5mS gap between successive time slots is there to allow TX/RX switching to take place.

Each time slot is split into three sections. At the centre is a sync. pattern which is used to synchronise the distant receiver's demodulator to the incoming time slot. That's surrounded by two payload sections which carry the actual voice and user data. One thing to remember is that a mobile or portable transceiver can transmit in Time Slot One or in Time Slot Two during a transmission, but not in both. Nor can the transmitter switch between Time Slot One and Time Slot Two during a transmission.

So let's get this clear. The transceiver transmits for 27.5mS and then switches back to receive for the other time slot. When Time Slot One (or Two) comes along again, the transceiver switches from receive to transmit for another 27.5mS. Yes, the transceiver is switching between transmit and receive every 60mS. That's just under seventeen times per second. And that's why when you listen to a DMR transmission on an analogue f.m. receiver it sounds like a rough buzzing noise. DMR repeaters receive both time slots and always transmit both time slots even if they're not in use. As the repeater's transmitter stays on all the time, the 2.5mS gaps between the time slots can be used to transmit additional data to the mobile and portable stations which are listening.

Because DMR is a purely commercial system it cannot handle amateur radio callsigns. The radios are uniquely identifiable, but a look-up table is needed to convert the radio's identifier to an amateur callsign. This table does exist (on the Internet) and part of it can be stored in an individual radio, but it's clearly not ideal. Furthermore, the radios themselves do not operate like normal amateur radio transceivers. Every channel you wish to use has to be available in a memory, and to program the memories you usually need a computer. Consequently, many radios sold to amateurs are supplied with memories ready programmed.

Unlike D-Star and Fusion, it's not possible to turn an analogue f.m. transceiver which has a 9600 Packet port into a DMR transceiver. Outboard units do exist for D-Star, and somebody will surely do the same for Fusion, if one doesn't exist already. With TDMA, the requirement for TX/RX switching times to be in the order of 2mS prevents this approach with DMR. In all, for commercial users DMR offers significant advantages over analogue but I feel it really isn't that suited - as it exists now - to amateur use. To be fair to DMR, it is a robust system. And TDMA operation has potentially significant advantages over FDMA operation, but unfortunately, DMR as it is at the moment doesn't realise these advantages.

The Future

The AMBE vocoder used by all the current digital voice systems used by amateurs is disliked because it's proprietary. We amateurs like to tinker with our radios, but legally, we can't tinker with the AMBE vocoder. An Australian amateur, David Rowe VK5DGR, has produced an Open Source vocoder - called Codec 2 - which apparently outperforms the AMBE vocoder at the same bit rate. It can also produce good results at 1,200bps. It's free to use and it's free to modify. The software is available to run on a personal computer and it's now available embedded in a small add-on unit - the SM1000 - that behaves like a speaker-microphone. This unit converts speech to Codec 2 and Codec 2 back to speech, and it includes a modulator. It can be used with just about any sideband transceiver. The mode - that's Codec 2 plus the modem - is known as FreeDV. But soon there'll be more. Hopefully. Bruce Perens K6BP and Chris Testa KD2BMH are working on a 'HT of the Future', called The Whitebox. This will be a software defined transceiver for v.h.f. and u.h.f. What makes it exciting is that it could potentially run all current amateur modes - both analogue and digital—that are used at v.h.f. and u.h.f. And that includes Codec 2. In addition, the Whitebox will be able to operate TDMA. Not DMR but a new mode which will allow full duplex communication on a single frequency and repeater operation on a single frequency. Note that DMR could operate this way but the manufacturers have not implemented such operation in their transceivers.

Digital voice may never completely replace analogue voice communication - I hope it doesn't - but it does offer certain advantages over analogue. And the best may be yet to come.

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